




ZLD  
Zero Liquid Discharge



**T**ODAY'S FAST-PACED  
POWER GENERATION  
MARKET REQUIRES  
TIMELY SOLUTIONS IN THE  
DESIGN, BUILDING AND COMMIS-  
SIONING OF NEW PLANTS. THE  
PERMITTING PROCESS CAN BE  
STREAMLINED BY EMPLOYING A  
“ZERO LIQUID DISCHARGE” (ZLD)  
SYSTEM. ZLD INTEGRATES  
WATER, WASTEWATER AND CHEM-  
ICAL MANAGEMENT PROGRAMS,  
INCORPORATING ALL WASTE-  
WATER STREAMS WITHIN THE  
POWER PLANT.

SUCH AN APPROACH GIVES  
ADDED FLEXIBILITY IN SITE  
SELECTION. A SITE ORIGINALLY  
DEEMED UNSUITABLE —DUE TO  
INADEQUATE WASTEWATER DIS-  
POSAL FACILITIES OR TIGHT ENVI-  
RONMENTAL REGULATIONS— MAY  
BECOME VIABLE WHEN ZLD  
TECHNOLOGY IS UTILIZED.

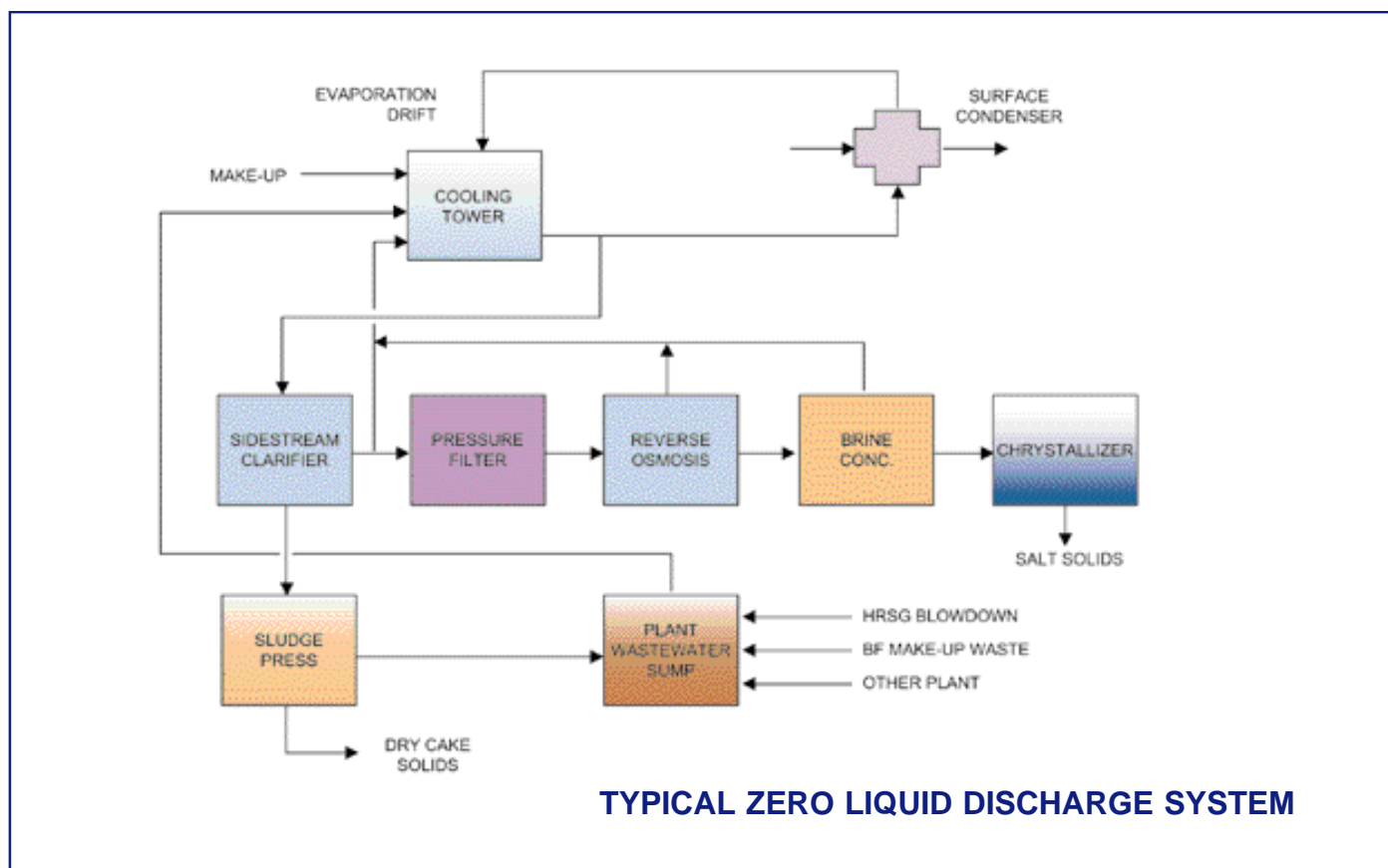
**O**ndeo Degremont’s industrial  
wastewater treatment system  
designers are experts in power gen-  
eration water supply. They are  
knowledgeable in the sources and  
characteristics of plant wastewater,  
the operational limits of the Cooling  
Tower, and the construction materi-  
als of wet surfaces within the recir-  
culation water loop. All of these fac-  
tors can effect the design, cost and  
operations of a **Zero Liquid  
Discharge (ZLD) System**.

In a ZLD design, the Cooling Tower  
is in essence the “trash can” to  
which all wastes are eventually recy-  
cled. The tower is “cycled up” to the

greatest limit allowed by the recircu-  
lation water chemistry, the surface  
condenser tube construction, or reg-  
ulations. Ultimately, regulations con-  
trol many aspects of system design,  
including the level of TDS in the drift  
(PM10). Ondeo Degremont ZLD  
experts are familiar with TDS limits  
and other design influences such as:

- Source and quality of the water or wastewater used for cooling tower and BFW makeup
- Cooling Tower evaporation and drift rates in both hot and cold weather conditions
- Wetted surfaces material of construc- tion within the recirculation water loop
- HRSG and Evaporative Cooler operation
- Expected plant operating mode (i.e. base load, peaks, etc.)





Power plant **makeup water sources** may be on-site wells, rivers or other surface supplies. In addition, available wastewaters may serve as the primary source of makeup water to a power plant. Such wastewaters may be generated by an adjacent industry, or may be municipal effluent. Each poses unique treatment requirements that are considered in ZLD system design by Ondeo Degremont power generation supply experts.

The heart of the Sidestream Treatment System (SST) is the **DensaDeg® High Rate Clarifier** (shown top right). Compact and

highly efficient, the DensaDeg is used to control recirculation water chemical constituents like calcium, silica, phosphate, TOC and suspended solids. In most situations, the bulk of the wastewater flow treated through the DensaDeg Clarifier can be returned to the Cooling Tower.

A portion of the DensaDeg clarifier effluent is further treated by **Reverse Osmosis** (RO) for control of the TDS in the Cooling Tower and as a means of concentrating the resulting wastewater. This wastewater is further treated in a **Brine Concentrator** (shown bottom right). Since reverse osmosis brine waste is the concen-

trated liquid stream requiring final treatment, it is desirable to minimize the amount of brine produced in order to reduce total costs.



Courtesy of Ionics RCC





Ondeo Degremont's proprietary **material balance spreadsheet** is generated for all new ZLD system designs. It incorporates all make-up and recycled streams, an iterative process—as some of the recycled wastewaters will change in quality as the tower is cycled up. The ability of the material balance spreadsheet to respond to changing conditions is critical in optimizing the size and cost of an Ondeo Degremont ZLD System.

Certain **recirculation water chemical limits** need to be respected when designing for zero liquid discharge. Ondeo Degremont design engineers utilize special software to establish recirculation water design limits and predict their effect on scaling and corrosion within the recirculation loop.

With any ZLD system, a **chemical program** needs to be tailored for the most effective treatment scheme. Ondeo Degremont designers are knowledgeable in chemical treatment aspects and work closely with the chemical conditioning provider during ZLD system design.



Courtesy of Psychromatic Systems, Inc.

The main objective in ZLD system design is to provide effective treatment at the lowest cost. In order to accomplish this objective, it is generally necessary to treat a sidestream flow in order to effectively reduce the level of controlled constituents within the recirculation water to below scaling levels.

This **Sidestream Treatment System** is also used to concentrate the liquid waste stream requiring further treatment. Depending on the source of the water available at the site, Cooling Tower pretreatment may or may not be necessary.

Within the Sidestream Treatment System, concentration of the liquid waste generated from the treatment process is critical, as it will ultimately be necessary to dispose of this wastewater either by on-site discharge to evaporation ponds or by some means of evaporation and crystallization. Either option can be expensive.

Efficiencies and cost containment measures are built into each Ondeo Degremont ZLD system design. Contact us for innovative ideas on your next project.





# ZLD

## Zero Liquid Discharge



Contact us for information on cost-effective water treatment solutions.

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